

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
KAZUFUMI ISHIYAMA :  
SERIAL NO: 930,993 :  
FILED: NOVEMBER 14, 1986 :  
FOR: CURVILINEAR ARRAY OF :  
ULTRASONIC TRANSDUCERS :

GROUP ART UNIT: 212

EXAMINER: BUDD

BATCH NO: V46

20  
RECEIVED  
MAY 14 1987  
DIRECTOR, GROUP 210

INFORMATION DISCLOSURE STATEMENT

HONORABLE COMMISSIONER OF PATENTS & TRADEMARKS  
WASHINGTON, D.C. 20231

SIR:

The references made of record herewith were cited in a European Search Report mailed on June 23, 1986 to Applicant's European associate in regard to Applicant's corresponding European patent application. A copy of this European Search Report is attached as well as copies of the references cited therein. Relevancy of the references with respect to the claims pending in Applicant's corresponding European application is stated on the search report.

The following are Applicant's comments regarding the references cited in the European Search Report:

JPA-57 188195 teaches a transducer/oscillator 21 overlapped with a part of a flexible printed circuit board 30 bonded together by means of a conductive adhesive 22. The flexible printed board 30 has conductor patterns and cuttings made with suitable pitch and length. To the oscillator 21, a matching layer 23 and an acoustic lens 24 are sequentially overlapped and bonded. The lens 24 is made of flexible silicon rubber and the oscillator 21 is provided with cut-off grooves 41 so that the oscillator 21 and the matching layer 23 are cut-off but the lens 24 is not cut-off with a length reaching a part of the printed circuit board 30. The oscillator 21 is bonded by matching it with a curved surface A of a packing member 51 having a two dimensional curved surface.

In contrast to Applicant's invention, the transducer taught by the Japanese '195 patent is not a convex array, but a concave array. Further, the FPC board in the reference is not disposed on the rear side of transducer elements between the transducer elements and a flexible backing plate, as taught by Applicants, but instead the FPC board is disposed on the front side of the transducer element. In Applicant's invention, the detachment of the FPC board from the transducer elements is prevented because the FPC board is sandwiched between the transducer elements and the

flexible backing plate, whereas the Japanese '195 patent relies on adhesive 22 merely to bond the FPC board to the transducer elements. Further, this Japanese reference does not teach the flexible backing plate of Applicant's invention. Therefore, in Applicant's view it is impossible to apply to teachings of the '195 Japanese patent to the production of a convex transducer and this reference does not obviate Applicants' claimed invention.

JP-A-59-202058 was published on November 15, 1984, after Applicant's priority date, but before Applicant's effective U.S. filing date. This reference teaches the provision of a convex transducer having a piezoelectric element array 12 formed on a thin flexible flat sound absorbing material 11, which after application of a matching layer 15 to the opposite side of the piezoelectric element array 12 is adhered to the curved surface of a second sound absorbing material 16. Electrical connection to the elements of the piezoelectric element array is made by means of a FPC board, but the connection thereof to the transducer elements is different in comparison to Applicant's invention. According to the '058 reference, the FPC

board is bonded after bending the transducer elements and flexible backing plate. The FPC board is not secured between the flexible backing plate and transducer elements, as taught by Applicant's invention. In this reference, it is elaborated to connect each lead line to the respective transducer elements, because the transducer array is being bent and the elements are positioned with very fine pitches.

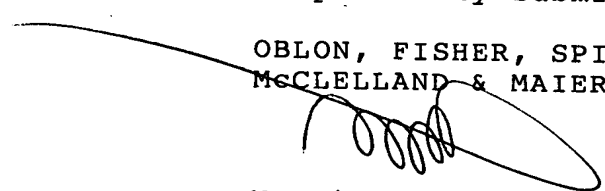
U.S. Patent 3,474,402 teaches a concave transducer and the possibility of a convex transducer, but the connection of lead wires is different than according to Applicant's invention. In this reference, the lead wires are directly connected to each transducer element as shown in figure 4 and as described at column 4, lines 61-69.

DE-A-2926182 discloses concave and convex transducers, but does not show the connection of the FPC board to the respective transducer elements according to the teachings of Applicant's invention.

U.S. Patent 3,587,561 and 4,281,550, also cited in the European Search Report have already been considered by the Examiner and are of record in the present application.

Respectfully submitted,

OBLON, FISHER, SPIVAK,  
McCLELLAND & MAIER, P.C.



Marvin J. Spivak  
Attorney of Record  
Registration No. 24,913

*Eckhard H. Kuesters*  
Eckhard H. Kuesters  
Attorney of Record  
Registration No. 28,870

Crystal Square Five-Suite 400  
1755 S. Jefferson Davis Highway  
Arlington, Virginia 22202  
(703) 521-5940